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ABSTRACT

Analysis of ten biology textbooks published in the 1970's revealed a de-emphasis in evolution as compared to the 1960's in the overall coverage of 44 topics concerned with evolution in these textbooks. Also, in certain textbooks the emphasis on selected topics concerned with evolution was drastically reduced or eliminated. Many changes in wording that were more cautious, less controversial, and more indefinite about evolution were made. Examples are given of changes that have occurred in various editions of three biology textbooks including "Modern Biology" by Moon, et. al. from 1921 to 1977, and BSCS textbooks. (Author/EE)

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"The De-emphasis of Evolution
in the Secondary School
Biology Textbooks
of the 1970's"

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During this century, opposition to the teaching of evolution in public classrooms has been commonplace and often widespread. The most dramatic opposition occurred in 1925 when John Scopes was brought to trial in Dayton, Tennessee on the charges of teaching evolution. This famous American trial was preceeded and followed by numerous legislative attempts to make the teaching of evolution in the public school illegal. These legislative attempts were ended in 1968 when the U.S. Supreme Court ruled that an Arkansas statute prohibiting the teaching of evolution was unconstitutional. After this judicial ruling, anti-evolutionists and creationists intensified their efforts to have legislation and educational policies enacted to mandate that the Genesis account of creation receive attention commensurate with that given the concept of evolution in science textbooks and classrooms.

Have educators and textbook authors and publishers been intimidated or influenced by the continued opposition and controversy surrounding the teaching of evolution? Based on the coverage given in secondary school biology textbooks to the topics concerned with evolution, the answer is clearly yes.

In 1969, an analysis of 83 secondary school biology textbooks published from 1900 through 1968 revealed that prior to 1960, evolution was emphasized in a cursory and non-controversial manner. However, there was a continued increase in emphasis of the concept from 1900 to 1950. This trend was reversed in the 1950's as the concept was de-emphasized slightly. The curriculum development activities of the Biological Sciences Curriculum Study in the 1960's resulted in textbooks which gave unprecedented emphasis to evolution. Also during this period non-BSCS textbooks began to emphasize evolution more. As a result, evolution

was emphasized as an important concept in most of the biology textbooks of the 1960's (Skoog, 1969).

Using the data of the 1969 study as a background, an analysis of ten biology textbooks published in the 1970's revealed a slight reversal in the trends of the 1960's. There was a decrease since the 1960's in the overall coverage of 44 topics concerned with evolution in these textbooks. Also, in certain textbooks the emphasis on selected topics concerned with evolution was drastically reduced or eliminated. Many changes in wording that were more cautious, less controversial, and more indefinite about evolution were made. It may be an overstatement to claim a de-emphasis of evolution has occurred in the biology textbooks of the 1970's but definite marked changes in such a direction seem obvious.

The 1977 edition of Modern Biology and the several editions that preceded it dating back to 1921 when Truman Moon authored Biology for Beginners illustrated the aforementioned trends. Table 1 indicated there was a gradual increase in the emphasis of evolution through successive editions until the 1950's when a decrease in emphasis occurred. Coverage peaked in the 1969 and 1973 editions and decreased in the 1977 edition.

TABLE 1

Modern Biology by Moon, et.al.

Year	Words on 44 topics	Year	Words on 44 topics
1921	4,184	1956	4,635
1926	4,467	1960	8,255
1933	5,778	1963	8,779
1938	7,019	1965	13,670
1941	7,019	1969	18,054
1947	7,717	1973	18,211
1951	5,072	1977	13,829

The 1977 edition of Modern Biology (Otto & Towle, 1977) covered natural selection in less than half the words used in the 1973 edition. The definition and explanation of evolution in the 1977 edition was much briefer than in 1973. Many other topics concerned with evolution received less attention in 1977 than in 1973.

Many changes in wording occurred in the last three editions of Modern Biology that indicated a more cautious approach. The statement "Likewise, modern man has probably evolved from primitive more generalized ancestors" (Otto & Towle, 1969, p. 561) was changed in 1973 to "Likewise, it is hypothesized that modern man has probably evolved from primitive more generalized ancestors" (Otto & Towle 1973, p. 623). In 1977, the statement was replaced with "Darwin was suggesting that humans may also have evolved from less specialized ancestors" (1977, p. 516). In the 1969 edition, the heading of the section dealing with human evolution read "Theories About Man's Development" (1969, p. 560). In 1973, the word thoughts replaced theories (1973, p. 622), and in 1977 the heading read "Thoughts about the history of Human Development" (1977, p. 516).

Many other changes in the 1977 edition reflected a more cautious approach by the authors. The sentence "Scientists do not doubt that organisms living today descended from species of previous ages" (Otto & Towle 1973, p. 200) was omitted in the 1977 edition. The statement "From what chordate ancestors did they evolve?" (1973, p. 514) was changed to "What Chordate ancestors did they develop from?" (Otto & Towle 1977, p. 412). The line "Archeopteryx was truly a mixture of reptile and bird characteristics" (1973, p. 576) became "The Archeopteryx seems to have been a true mixture of bird and reptile." (1977, p. 473). "That there are so many species of birds today is the result of adaptations to the different environments, diets, and types of life" (1973, p. 473).

was changed in 1977 to "The various species of birds are probably a result of adaptations to different environments, diets, and types of life". (1977, p. 4737).

Overall, the words "probably" and "seems" were used frequently in the 1977 edition. The term evolved often was replaced by the word developed, descended, or sprang.

The 1977 edition of Modern Biology definitely covered evolution in a more comprehensive manner than the editions written before 1965. However, the coverage of evolution in the 1977 edition was more conservative and brief than the coverage in the 1973 textbook.

Table 2 indicated the emphasis on evolution in Biology by W. R. Smallwood and E. R. Green (1977) was much less than in the 1968 and 1974 editions.

TABLE 2

Number of words allocated to 44 topics concerned with Evolution in Biology by W. R. Smallwood and E. R. Green.

1968 - 22,121

1974 - 20,344

1977 - 11,431

Table 3 illustrated how certain topics concerned with evolution were reduced or eliminated in the 1977 revision of the 1974 edition of Biology. (Smallwood & Green, 1974).

Number of words on Selected Topics in the 1974 and 1977 editions of Biology by Smallwood and Green.

Topic	1974 Edition	1977 Edition
Darwinian Thesis of Evolution	2,753	296
Life of Darwin	1,373	45
Life Origin Hypotheses	2,023	322
Natural Selection	1,025	417
Evolution of Amphibians	41	0
Geologic Eras	234	0
Fossil Formation	186	0
Evidence of Evolution Through Domestic Breeding	414	0
Special Creation	176	0
Mechanisms of Evolution		
Geographic Isolation	408	0
Reproductive Isolation	140	0
Polyploidy	348	0

The decreased emphasis in the 1977 edition of Biology was accompanied by an increased emphasis on the phylogentic study of plants and animals. Emphasis on other topics in the textbook seemed to be unchanged by the revision.

Significant changes in wording occurred in the revision of the 1974 edition of Biology. "A. africanus evolved" (Smallwood & Green, 1974, p. 281) became "A. africanus could have evolved" (Smallwood & Green, 1977, p. 281). In 1968, the authors stated "But we have not mentioned the most convincing evidence--that there is a unity of structure and function throughout the biosphere" (Smallwood & Green, 1968, p. 188). This was

changed to "A great many biologists look upon the unity in the biosphere as the best indirect evidence that all forms of life have common ancestry" (1974, p. 170). In 1977, the statement became "Many biologists agree that the best indirect evidence for the theory of evolution is at the cellular and molecular level" (1977, p. 164).

There was frequent use of the word "theoretical" in the 1977 edition of Biology (Smallwood & Green, 1977). The statement "This is one of the reasons birds are considered to be fairly close evolutionary relatives of reptiles" (1974, p. 367) was rewritten as "Certainly, there is little doubt that the reptiles were the theoretical ancestors of the birds" (1977, p. 255). Fish were considered as "the theoretical ancestors of all other vertebrates" (1977, p. 243) whereas Annelids were termed the "theoretical ancestors of arthropods" (1977, p. 232).

In the 1974 edition of Biology (Smallwood & Green, 1974), the authors stated that "It would be unfortunate for any student of biology to study natural selection without studying the man who was most responsible for its explanation, Charles Darwin" (1974, p. 175). Nearly 1400 words were used to describe portions of Darwin's life and over 2700 words were used to explain the Darwinian thesis of evolution in the 1974 edition. In the 1977 edition, the words used to cover these two topics were 45 and 296 respectively.

In the 1974 edition, Smallwood & Green also indicated that Darwin's explanation of natural selection had "withstood rigorous experimentation and is now considered to be a scientific fact" (1974, p. 197). They also used a quote by Ernst Mayr that said "It can be stated dogmatically that the few who still object to natural selection are

among those who have not kept up with genetic theory" (1974, p. 193). These statements were not included in the 1977 edition. The emphasis on natural selection was also reduced in 1977. The 1974 edition used 1025 words to explain natural selection whereas the 1977 edition utilized 417 words to cover the topic.

The reduction of the number of words used to explain the topics concerned with the study of evolution, the elimination of certain statements, and the appearance of more cautious statements are evidence that the 1977 edition of Biology (Smallwood & Green, 1977), when compared to the 1968 and 1974 editions, de-emphasized the study of evolution.

The 1967, 1974, and 1977 editions of Biology by S. L. Weinberg contained 19,206, 21,739, and 18,941 words respectively on the 44 topics concerned with the concept of evolution. While the overall coverage has not been drastically reduced or coverage of individual topics eliminated, it was clear the author and editors of the 1977 edition of Biology devoted less space to evolution than in previous editions.

Changes in wording were minor, but still noticeable. In 1967, Weinberg wrote "We know that species change. This fact of evolution has several consequences." (1967, p. 159). The statement was changed in 1974 to "We now believe that species change. This understanding has many consequences." (1974, p. 103). Weinberg stated in 1967 that "In the end it generally came to be accepted by educated people because of Darwin's overwhelming proof that organisms do change" (1967, p. 450). In 1974, this statement was softened to read "In the end, Darwin's evidence for evolution, came to be generally accepted" (1974, p. 1460). The 1974 edition stated that "Without indicating

the precise line of development, Neanderthal and Java man show that modern man originated from more primitive primates. Various other fossil species, discovered since, support the concept." (1974, p. 511) This was changed in 1977 to read "Without telling us the precise line of descent Neanderthal man and Homo erectus suggest that modern human beings originated from more primitive ancestors". (1977, p. 452).

Collectively, the changes in Biology from 1967 to 1977 did not signal a major de-emphasis of evolution by Weinberg. Furthermore, the changes made by Weinberg were not of the magnitude as those made by Smallwood and Smith. Yet the changes by Weinberg did conform to a noticeable trend and tendency by authors and editors in the 1970's to be more cautious and conservative in their coverage and emphasis of evolution.

Biology: Living Systems (Oram, 1976) was also analyzed. A 1973 edition of this book was not available for the study so comparisons between the two editions were impossible. The number of words used to explain topics concerned with evolution in this textbook totaled 13,335. This total was greater than that of five non-BCBS textbooks published between 1960 and 1963, but less than the totals for 3 non-BSCS textbooks published in the period 1965-1967. The total coverage of evolution in Biology: Living Systems was less than in any of the BSCS editions in the 1960's and 1970's.

TABLE 4

Number of Words Allocated to 44 Topics
Concerned With Evolution in BSCS Textbooks

Year	Green	Yellow	Blue
1961	22,389	34,761	23,306
1963	30,383	45,898	22,987
1968	19,732	42,621	21,717
1973	18,626	31,050	19,400

The biology textbooks developed by the Biological Sciences Curriculum Study in the 1960's gave unprecedented emphasis to the concept of evolution. (Skoog, 1969) However, the emphasis, as measured by word counts and subjective judgments, has fluctuated and some topics have been de-emphasized in later revisions. Also word changes in the BSCS textbooks inferred that the publishers had been careful to avoid words and phrases that may be offensive and possess a potential for arousing controversy.

Table 4 indicated the change in coverage of evolution, as reflected by word counts, in the BSCS textbooks. In the revisions of the three BSCS Versions, certain topics were reduced in emphasis, others were expanded, some deleted, and others added. The total number of topics concerned specifically with evolution varied from edition to edition. The number of words utilized to explain the concepts related to evolution has decreased in all three BSCS versions from 1968 to 1973.

Despite the use of fewer words, the strength of the presentations and the emphasis on evolution still remained. In many cases, the reduction of words was due to better editing.

Several changes have occurred in the revision of the BSCS textbooks that indicated the authors and editors have become increasingly cautious in the selection of words used to discuss evolution. In 1963, the following statement was included in the BSCS Blue Version Biological Science Molecules to Man:

The fossil evidence suggests that life has been changing slowly from one form to another over millions of years. To biologists there is no longer any reasonable doubt that evolution occurs. (1963, p. 297)

The 1968 and 1973 editions of Molecules to Man deleted the second line of the quote. The 1968 edition stated that "Biologists agree that Darwin's presentation of both the evidence for evolution and the theory of natural selection marks him as one of the greatest scientists of all times" (1968, p. 76). This statement did not appear in the 1973 edition. In 1968, "Change of organisms through time as evolution" (1968, p. VIII) was listed as one of the seven themes of the textbook. "As evolution" (1973, p. IX) was removed from the phrase in 1973.

The last line in the Highlights of the Chapter section of a chapter on evolution concluded in the 1968 version that "Throughout this book it will be evident that the theory of evolution by natural selection is the major framework of modern biology" (1968, P. 84). This sentence was also omitted in 1973. In 1961, fossil evidence was said to "dramatically show" that evolution had occurred (1961, p. 57). In the 1968 textbook the statement read that the fossil evidence "suggests" that evolution had occurred (1968, p. 49). The statement "Biologists are convinced that the human species evolved from nonhuman forces" appeared only in 1963 version (1963, p. 411). The line "man is the most outstanding product of evolution" (1968, p. 657) was not used in the 1973 edition.

While the aforementioned changes were minor, they are an indication that the objections made against Molecules to Man in various sections of the nation may have been effective in bringing about minor changes in the content concerned with evolution.

The four editions of BSCS Green Version varied slightly in their emphasis on evolution. There has been little variance in the number

of topics included that deal with evolution in each edition. The increase in word totals in the 1963 edition High School Biology, as can be noted in Table 4, was attributed primarily to the increase in coverage given to two topics--geographic isolation as a cause of variation and evolution and geological eras. The decreases in the 1968 and 1973 editions were also primarily the result of a de-emphasis of these two topics even though several other topics were reduced by 50-200 words each.

Word changes and omission of certain statements also occurred in the revision of the BSCS Green Versions. The statement "about a century ago most biologists became convinced that the different kinds of organisms are related through ancestry" (1968, p. 145) was revised to read "Nevertheless, about a century ago most biologists accepted the theory that the species of organisms are related through ancestry" (1973, p. 138). In the forward of the 1968 textbook, one of the themes was listed as "change of organisms through time as evolution". The "as evolution" part of the phrase was deleted in the 1973 edition. In 1963, evolutionary relationships as a part of classification were more overtly discussed than in the 1968 and 1973 editions.

Overall, the chapters concerned with evolution in the 1973 edition of BSCS Green Version--Biological Science An Ecological Approach were revised much. Deletions and rewording of material from the 1968 were commonplace. In many cases, the revisions represented good editing. In other places, material was omitted resulting in the coverage being less complete. Despite these changes and the failure to integrate evolution within many of the other topics, the coverage of evolution in Biological Science An Ecological Approach was quite comprehensive.

Table 4 indicated the 1973 BSCS Yellow Version edition of Biological Science An Inquiry Into Life contained 11,000 fewer words on topics concerned with evolution than did the 1968 edition and 14,000 words fewer than the 1963 edition. Despite the reduction of coverage, the 1973 BSCS Yellow Version textbook still covered evolution in a more intensive manner than any of the other ten secondary school biology textbooks published in the 1970's and analyzed in this study.

Topics receiving less emphasis in the Yellow Version of 1973 than in 1968 included discussion of the evolution of fish, amphibians, and plants, geological data concerning the age of the earth, hypotheses concerned with the origin of life, various evidences of evolution, causes of evolution and variation such as mutation, recombination and geographic isolation, the human fossil record, and cultural evolution. Some topics received a slight increase in emphasis but were not of the same magnitude as many of the decreases.

Many word changes were made in the 1973 Yellow Version edition of Biological Science An Inquiry Into Life. The 1968 edition referred to Darwin's theory of the origin of species whereas in 1973 it was referred to as a hypothesis. In 1963, evolution was called a well-established concept (1963, p. 4). Theory was substituted for concept in 1968 (1968, p. 14). The reference was omitted entirely in 1973. In 1968, it was stated:

This fossil evidence dramatically shows that life has been gradually changing over millions of years from one form to another. There is no longer any reasonable doubt that evolution occurs all through ages of the past (1968, p. 582).

In 1973 the first sentence of the passage was made less definite and the second sentence narrowed to biologists. Thus it read:

It is difficult to interpret the fossil record in any way other than as evidence that life has been gradually changing over millions of years from one form to another. Biologists no longer have any reasonable doubt that evolution occurs and that it have occurred all through the ages of the past (1973, p. 740).

In a 1968 discussion of insectivores, the line "From them evolved the first primates" was used (1969, p. 615). The 1973 edition was less definite in stating, "Some scientists believe that primates may have evolved from another order of mammals--the insectivores" (1973, p. 774).

Despite these and other changes in wording, readers of the 1973 edition of the BSCS Yellow Version Biological Science An Inquiry Into Life will encounter an in-depth coverage of evolution supported by statements such as: "a century after Darwin, the natural, or scientific, answer seems clear. Man has evolved. (1973, p. 781)" and "The path of man has been dramatic, violent, noble, and filled with paths. Where does the path lead?" (1973, p. 787)

This study indicated that the efforts to have the Genesis account of creation included in biology textbooks have been unsuccessful as only three of the textbooks published in the 1970's and analyzed in this study included any material on this topic. Two of three textbooks were the 1974 and 1977 editions of Biology by Weinberg. This was consistent with a previous study which indicated that only three of eighty-three biology textbooks published between 1900-1968 discussed special creation (Skoog, 1969). Furthermore, because of the requirements of the First Amendment of the Constitution, the methodology and nature of science, certain theological considerations, and principles of curriculum development, efforts to have governmental bodies adopt laws or policies mandating that the Genesis account of creation receive attention commensurate to the concept of evolution in biology textbooks should be firmly resisted (Skoog, 1978).

Overall, this study indicated certain textbooks have de-emphasized the study of evolution and most of the textbooks made word-changes and deletions that indicated editors and publishers could be succumbing to outside pressure to emphasize evolution to a lesser degree. Biology teachers and those individuals responsible for developing and implementing a modern and relevant biology curriculum should insist this trend be halted and that future editions of biology textbooks contain a comprehensive treatment of evolution inasmuch as biology without the light of evolution becomes "a pile of sundry facts" (Dobzhansky, 1973, p. 125).

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